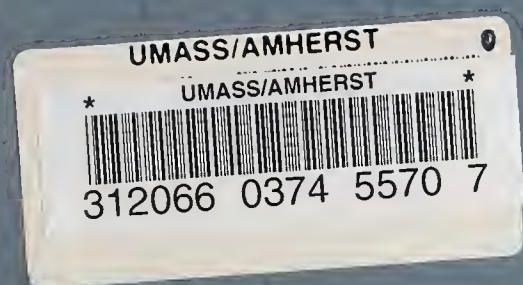


METROPOLITAN DISTRICT COMMISSION

WATER CONSERVATION REPORT

Over two million people in forty-four communities in Metropolitan Boston and across the state depend on the Metropolitan District Commission to deliver a safe and adequate supply of water to meet their needs. All of these communities and others that have recently turned to the MDC for additional supplies must understand that only an unusually wet period—several years of above average precipitation—has forestalled a water crisis: a severe shortage in an apparently water abundant area.



Water Division
20 Somerset Street
Boston, Massachusetts
02108

ENOUGH WATER? The Basic Issue

The MDC currently sells water to 32 cities and towns that are members of the Metropolitan Water District, within a 15-mile radius of the State House in Boston. Seven of these communities have their own local supplies which are augmented by the water which they buy from the MDC. Two more members are scheduled to begin receiving water as soon as distribution pipes are completed. In addition, the MDC supplies all or part of the water to ten Massachusetts communities outside of this official district. The entire system is paid for solely by the people who use the water.

The MDC draws water of extremely high quality from a system of reservoirs which includes Quabbin and Wachusett in central Massachusetts. These reservoirs capture the runoff from some 390 square miles of watershed and have the capacity to store approximately 477 billion gallons of water. This amount is equivalent to over three years of supply for MDC users at their current rate of consumption.

The system can be depended upon to supply some 300 million gallons of water per day (mgd). This amount represents the safe yield of the system or the amount of water which can be guaranteed throughout a critical dry period.

The large storage capacity of the reservoirs allows the MDC to compensate for fluctuations in demand and for dry periods during which demand exceeds runoff into the reservoirs. However, even this system has its limits. A sustained period of demand in excess of safe yield may deplete this storage and, depending on the length of the dry period and the severity, cause a water crisis.

In 1977 MDC resources supplied some 319 million gallons per day to all their consumers, and in 1978, 317 mgd. Of this, some 270 mgd was used by the 25 communities of the fully supplied district and another 9 mgd by members and other consumers partially supplied in the Boston metropolitan area. The remaining 38 mgd was supplied to users outside the Metropolitan Water District.

The total demand on MDC sources first went above the 300 mgd safe yield in 1969 and has continued to exceed it in every succeeding year. Fortunately during this time the actual precipitation has been considerably above normal so that the stored supply has not been depleted. However, the demand for MDC water will continue to exceed safe yield for the following reasons:

- the total population of the service area is growing;
- historically water consumption per capita has increased;
- a number of communities appear to have no alternative but to turn to the MDC for water to augment their own supplies;
- contamination of community well supplies is a growing problem;
- demand increases during prolonged dry periods; and,
- droughts similar to the one in the '60's are inevitable.

The imbalance between safe yield and use must be corrected and future needs must be met. In an effort to respond to the water needs of the communities it serves, the MDC has taken action on several fronts. The programs are outlined in greater detail on the enclosed pages. The report is designed to be amended as MDC water supply and conservation planning continues. Supplementary sheets will be issued periodically.

WATER SOLD* TO OTHER USERS NOT MEMBERS OF THE DISTRICT

	1974 Consumption in Mil.Gals.	1975 Consumption in Mil.Gals.	1976 Consumption in Mil.Gals.	1977 Consumption in Mil.Gals.	1978 Consumption in Mil.Gals.
Chicopee	4,250.780	3,855.925	3,813.715	4,039.986	4,004.844
Wilbraham	290.340	306.740	292.047	293.030	288.864
So. Hadley Fire Dist. No. 1	615.395	595.655	675.459	694.060	682.553
** Worcester	-	-	-	240.932	-
Clinton	810.500	760.400	799.100	845.800	832.800
**Leominster	470.100	79.000	276.900	184.800	411.800
** Northboro	3.475	18.789	12.366	4.518	7,328
Westboro State Hospital	58.878	49.186	46.142	43.945	38.232
** Marlborough	1,003.245	898.465	896.437	1,162.479	1,146.470
** Southborough	169.560	172.368	174.141	193.818	164.537
Framingham	2,939.542	2,871.500	2,974.095	3,080.875	3,080.400
** Lynn	393.136	359.469	393.055	288.337	302.221
General Services Administration	10.100	20.003	21.709	20.182	19.718
MDC Parks Division	104.009	138.093	145.716	176.547	181.254
MDC Sewerage Division	4.686	5.586	3.174	1.566	1.240
Walter E.Fernald School & Met. State Hospital	202.864	203.546	196.729	219.022	194.459
**	11,326.610	10,334.725	10,720.785	11,489.897	11,356.720

* These sales are authorized by specific legislation and subsequent contracts and require the concurrence of Water District members.

** Partial Supply

*** In 1974, an additional 599.507 Mil. gals were sold to S.J. Groves & Sons for construction work on the Dorchester Tunnel in the City of Boston.



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CONSUMPTION OF WATER DISTRICT MEMBERS 1974-1978

City or Town	1974 Consumption in Mil. Gals.	1975 Consumption in Mil. Gals.	1976 Consumption in Mil. Gals.	1977 Consumption in Mil. Gals.	1978 Consumption in Mil. Gals.
Arlington	1,907.236	1,987.321	1,957.991	1,824.723	1,795.026
Belmont	947.471	1,034.929	1,023.489	1,042.401	1,067.557
Boston	52,918.177	53,701.746	55,039.662	53,327.975	52,213.548
Brookline	2,665.806	2,691.531	2,578.854	2,652.781	2,766.620
Cambridge	150.340	416.649	191.396	24.960	-----
* Canton	425.960	223.290	264.374	275.364	355.654
Chelsea	1,478.249	1,276.546	1,350.189	1,198.907	1,181.737
Everett	2,794.524	2,823.389	2,845.629	2,739.412	2,958.771
Lexington	1,465.643	1,636.804	1,688.937	1,773.748	2,000.147
Lynnfield Water Dist.	133.119	145.624	153.847	144.885	147.666
Malden	2,760.664	2,526.484	2,450.893	2,541.586	2,368.869
Marblehead	836.488	877.298	837.873	847.586	909.909
Medford	2,883.309	3,148.536	3,301.177	3,239.799	3,348.080
Melrose	1,029.752	1,233.398	1,179.683	1,099.993	1,120.183
Milton	935.772	881.218	1,003.811	1,053.548	1,230.208
Nahant	149.120	153.321	152.776	167.036	149.051
* Needham	339.055	367.421	367.228	357.886	364.370
Newton	4,526.596	4,837.063	4,495.932	4,461.536	4,161.637
Norwood	1,615.050	1,488.950	1,487.437	1,433.428	1,498.665
* Peabody	261.829	425.226	567.384	102.170	281.100
Quincy	3,654.761	3,983.684	3,838.554	4,103.421	4,208.489
Revere	1,580.172	1,560.876	1,602.658	1,742.561	1,728.036
Saugus	850.730	978.825	1,284.723	1,325.133 ¹	1,383.328
Somerville	3,881.188	3,346.479	3,298.971	3,186.012	3,448.622
Stoneham	1,280.564	1,148.562	1,175.998	1,153.403	1,325.082
Swampscott	574.258	663.307	641.315	743.850	753.480
* Wakefield	879.300	865.020	859.230	844.680	711.000
Waltham	4,207.342	4,080.041	4,080.240	4,170.330	4,221.726
Watertown	1,646.767	1,758.472	1,837.036	1,845.437	1,790.492
* Weston	430.065	425.858	426.408	400.646	407.382
* Winchester	292.023	397.106	319.299	479.690	412.439
Winthrop	669.377	729.118	765.655	832.710	825.760
TOTAL	100,170.707	101,814.092	103,068.649	101,137.597	101,134.634

* Partial Supply only

METROPOLITAN DISTRICT COMMISSION

WATER CONSERVATION REPORT

LEAKAGE SURVEY & REPAIR PROGRAMS - MDC SYSTEM

June, 1979

The MDC's Water Division is responsible for approximately 260 miles of pipe in its distribution system. These pipes range in size from eight (8) inches to 11 feet in diameter with an average size of 48 inches. (By comparison, the distribution systems of the cities and towns of the district include approximately 4400 miles of pipe with an average diameter of eight (8) inches. Leakage control is a constant feature of overall maintenance of the water supply system. A certain amount of leakage is inevitable; leaking is never "cured" but can be controlled. Responsible management requires good monitoring of the system and an ongoing maintenance program for leakage control.

The leak detection methods the MDC has used in the past relied mainly on physical inspection, reports from observers and review of meter flow data for unusual trends. Due to the relatively large size of the MDC pipes, leaks or breaks are usually evident whereas leaks in low capacity, small diameter piping may escape immediate notice. Also, in the past, formal leakage testing was mainly done by hydrostatic methods which are difficult, costly and required that the pipe be taken out of service for the test.

Recently, however, great advances in cost and accuracy have been made in electro-acoustical methods of leakage detection. In order to take advantage of this technology, the Water Division purchased leak detection apparatus and instituted an ongoing leakage testing program beginning in the Spring of 1978. To date testing crews have covered about three-fourths of the 260 miles of MDC pipelines.

Thus far this program has resulted in the detection and repair of two leaks that otherwise might have gone long undetected. One of these was on the MDC's lines and one was found on a local distribution system line immediately adjacent to the MDC connection. (This leak was reported to and subsequently fixed by that community.) These two leaks were in addition to the 26 leaks found by the traditional system of inspection and observer reports for the year 1978. The Water Division's Distribution section normally locates and repairs some 30 to 50 leaks per year.

It is difficult to estimate the water savings attributable to these leakage repairs. There is little doubt, however, that the leak detection program will prove to be a productive conservation measure -- particularly in conjunction with the planned meter telemetry system which will automatically check the system for pressure changes or other indications of potential leakage.

Weston Aqueduct

Other leakage control projects currently underway are the reconditioning of the Weston Aqueduct and the repair or replacement of steel pipelines in the distribution systems.

The Weston Aqueduct, originally built in 1903, is a horseshoe shaped, gravity flow aqueduct approximately 13 feet in diameter and 13.5 miles long. Several

years ago, sections of the aqueduct were discovered to be leaking. After funds were secured, the badly deteriorated sections were repaired in two contracts - the first in 1977 and a second in 1978. A third section is currently under repair.

Pipeline Replacement

Several sections of steel pipelines are scheduled to be replaced or repaired due to poor structural condition and frequent maintenance requirements. Steel pipelines exhibit a greater tendency to corrode and pit resulting in more frequent leakage than the cast iron or concrete pipelines which make up the bulk of the MDC's system. Several sections in poor condition will be removed and replaced while other sections will be uncovered by excavation and cement mortar-lined to protect against further corrosion and deterioration. Funding in the amount of \$3.1 million has been received and design of the improvements is currently underway by Water Division staff.

Leakage in the MDC System

Statistical analysis performed in an effort to pinpoint the amount of water leaked from the MDC transmission and distribution system before it gets to the communities has shown optimistic results. The best estimates indicate a very low percentage of loss within the MDC system itself -- well below the 5% anticipated as the amount of unavoidable leakage for most systems.

Over the course of the last calendar year, the Water Division's statistical office has maintained a careful tally of the difference between flow through MDC master meters, which records the amount of water entering the system, and that through the revenue meters which records the amount of water sold to the communities as it enters the individual systems. By the end of the year, total data yielded a variation of 2% which represents a loss due to leakage in the Metropolitan Water System of approximately 6 mgd.

METROPOLITAN DISTRICT COMMISSION

WATER CONSERVATION REPORT

CONSERVING WATER AT HOME - WHAT YOU CAN DO

June, 1979

In addition to the management programs for water conservation which the MDC is undertaking, people can begin to conserve water immediately in their homes using measures which cost nothing and cause little or no inconvenience.

Many different kinds of water-saving devices and plumbing fixtures are on the market, ranging from special reduced-flow shower heads to water-thrifty shallow trap toilets. Information about them is available from plumbing suppliers. The MDC will be compiling information on these devices as part of a long-range public education program. In the interim, however, changing water-using habits and a few low-cost tricks can accomplish water savings as well as savings in energy for heating water.

The BATHROOM accounts for 75% of residential water use, and the toilet alone, some 40%, or an average of 56 gallons per day for a four-person household! Depending on the tank size, a toilet uses 5-7 gallons per flush. The amount of water used can be reduced by limiting flushing to human wastes and toilet paper. Commonly, these five or seven gallons are used to wash away a cigarette butt or a spider.

The volume of water per flush may also be reduced with a home-made device. A plastic bottle filled with clean stones may be placed in the tank, being careful not to interfere with the mechanism, thus displacing some of the water. Do not displace so much that two flushes are required-- this wastes more than you have saved. (Bricks should not be used. They can crack the tank if accidentally dropped, or disintegrate, causing flakes to damage moving parts.)

Reducing the volume of water for bathing requires a more conscious effort to change habits. A full tub can use some 35 gallons of water while a minimum water level (one quarter full) can accomplish the same purpose with only 15 gallons.

A shower is more variable depending on the time. A 10-minute shower can use between 50 and 100 gallons of water. In addition to cutting the length of shower to five (5) minutes (some families use a timer), a conscientious water saver can turn off the shower while soaping.

Flow reduction showerheads are now available which reduce total flow in the shower from about 11 gallons per minute (average flow with a standard shower head) to three (3) gallons per minute. The principle of the design is to mix air and water and achieve the same effective cleaning capacity. Faucet aerators are also available.

Running water continuously while shaving or brushing teeth is also an unnecessary waste. It is a simple matter to fill the basin for personal uses. This can reduce the amount of water for shaving from 20 gallons (if the water is run continuously) to one gallon.

In the KITCHEN, most of the water is wasted simply by letting it run down the drain. When washing dishes by hand, fill two (2) basins -- one for wash and one for rinse. Even if you have to change the water a few times, the savings are enormous compared to the amount used if the water is run continuously.

Fill a pan of cold water for washing vegetables. Do not let the water run freely.

For drinking water, fill a container and let it cool in the refrigerator. Do not waste several glasses of water in an effort to get a single cool one from the tap.

Automatic dishwashers use some 15-25 gallons of water per run. Use it efficiently by running only full loads. For most washers, pre-rinsing is unnecessary. Soak very stubborn dishes but most can be scraped into the garbage and let the machine do the rest.

Garbage grinders can use substantial amounts of water for flushing and cooling (as much as two gallons per minute). To save water, they should be used in a more limited way. Again, wait for a full load and be selective. Dispose of most garbage with solid waste in the trash can.

The LAUNDRY is another big water user. Many washing machines can use 40-60 gallons of water for a full cycle at top water level. When buying a new machine you can find a model that uses less water or a "suds saver" model that saves wash water for later loads. Meanwhile, the important habit is again to wash only full loads, and/or use the water level controls to adjust the amount of water to the size of the wash.

For hand-washing clothes, use the sink stopper or a basin. Do not let the water run.

LEAKS in home plumbing can add up to a great deal of wasted water. A conservation plan in the home should begin with a leak check. A faucet leak of 1/16" can result in the loss of over 100 gallons a day. All faucets should be checked and worn out washers replaced periodically. A silent toilet leak may be detected by putting a few drops of food coloring in the water closet. If the color comes through to the toilet bowl without flushing, there is a leak which needs repair.

OUTDOOR USE of water during the summer months can be excessive. A half inch garden hose, at normal household pressure delivers water at the rate of 10 gallons per minute --or 600 gallons an hour! Water savers should generally put this fixture at the bottom of the priority list but when it is used, the same principle applies outside the house as inside. Do not let the water run freely.

LAWN WATERING should be done in the evening or early morning when the air is cool and still and less water is lost through evaporation. Wind or a misdirected spray can water more pavement than lawn. A two-inch high lawn holds more dew and shades the root system better than one more closely cropped and still looks neat.

MULCHING gardens prevents soil drying and plastic around plants also helps control weeds.

SMALL GARDEN AND PLANT WATERING can also be accomplished by collecting the clean water which is run while the shower warms up, or that used for vegetable washing, or other sources--even a rain barrel. The "trickle" or "drip" irrigation system uses 25 to 50 percent less water than usual sprinkler systems. A tiny plastic hose around closely placed plants drips water out of strategically placed holes. The slow watering allows the water to percolate deeper rather than run off and less water is wasted.

CAR WASHERS are often the greatest offenders in water waste. Washing from a bucket is as effective as a freely running hose which can waste hundreds of gallons in only a few minutes. The hose is really only necessary for a final rinse or perhaps an initial wetting.

These simple habits can add up to water savings which may help to avoid costly supply and treatment projects in the future. Be a "water miser" and teach your children to be one too.

METROPOLITAN DISTRICT COMMISSION

WATER CONSERVATION REPORT

CONSERVATION PLANNING

June, 1979

No matter what new supplies are provided or watershed and supply management options are implemented, conservation techniques must hold the line against increasing consumption and severe depletion of water resources.

The MDC recognizes its responsibilities under Chapter 92, Section 15 of the General Laws, to

"... take all proper measures to determine the amount of water used and wasted and to prevent the improper use or waste of water."

The Commission has begun to plan conservation techniques in conjunction with an overall water management policy which discourages waste and promotes the proper balance of supply, demand, and wise use of its water resources.

The first steps in the MDC's conservation efforts have been directed at so-called "unaccounted-for" water within MDC's own transmission and distribution system. Metering and leakage programs, described on accompanying pages, have been instituted by the Water Division to improve the monitoring of water delivered to cities and towns and to insure the integrity of its own transmission lines with respect to potential waste from undetected leaks.

Conserving Water in MDC Facilities

In January of 1977, the MDC began a program of water conservation in its own facilities starting with the use of water-saving devices in all new construction. MDC design contracts have been required to incorporate water-saving devices in all plans and drawings. Construction contracts must specify the use of water-saving appliances including, but not limited to, faucet heads, shower heads, toilets, lawn sprinkler systems, and recycling in cooling systems. In addition, each division has inventoried their existing facilities in preparation for a retrofitting program. Information will be made available as work on this program progresses.

Cooperation with User Communities - Consumption Data

Along with this work on its own system, the MDC is looking to its member and partial user communities for cooperation in the development and implementation of conservation programs. The first step has been to review and analyze consumption figures in an attempt to identify those uses and/or users most appropriate for water conservation action. The Water Services and Metering Report questionnaire, sent annually to member communities, has been revised this year in an effort to improve the quality of water-use data available to the MDC for planning. The MDC has asked the non-member communities which use the system's water resources to participate by supplying usage data this year.

Leakage Detection and Repair - Systems Rehabilitation and Renovation

Many of the responses indicate programs by member communities to keep their metering systems in good working condition. Full metering is, of course, not only the first step in providing accurate usage information but also provides the only way to monitor conservation efforts.

One of the largest categories of water consumption in user communities is the so-called "unaccounted-for". This category includes unmetered public uses such as fire protection as well as meter under-registration and leakage. The Water Division has been attempting to address this problem -- initially by improved local metering and data collection to identify how much of the unaccounted-for water is actually "wasted" through avoidable leakage.

Many communities have already undertaken their own leakage detection and repair programs. Information on these programs will be compiled for a future update to this report.

Public Education

Water consciousness is a basic ingredient of any conservation program and the MDC will be directing its attention to increasing this understanding and cooperation among users of its water resources. A public education program to inform the public about the water supply situation and what role individuals can play in a conservation effort is being planned.

Water Conservation Studies

In addition, the MDC is cooperating with conservation studies in progress at the New England River Basins Commission, the New England Interstate Water Pollution Control Commission and the Massachusetts Conservation Service Corporation of the Massachusetts Association of Conservation Commissions in conjunction with the Division of Water Pollution Control. The result of these studies, in addition to their own research, will help the MDC determine what conservation techniques are most appropriate for implementation in the MDC user communities.

1W55-CA422: 129/1111

METROPOLITAN DISTRICT COMMISSION

WATER CONSERVATION REPORT

METER MODERNIZATION PROGRAM - MDC METERS

June, 1979

A major study of the MDC's metering system was completed in May, 1978. The study included testing and evaluation of the MDC's 158 revenue meters which measure water delivered to communities at the connection to the local system. The present method of data collection and meter maintenance was also reviewed.

New Revenue Meters

The report recommended replacing all of the 50 compound-type meters because of their excessive maintenance needs and poor accuracy. The remaining 108 revenue meters are all venturi-type meters which were found to be reasonably accurate, but a small number were recommended for replacement due to incorrect sizing. Problems with non-standard hardware and malfunctioning recording equipment were encountered. The report advised new standardized equipment for all of the revenue meters including new access chambers, recording instruments, line pressure sensors, and power supplies.

Computer Monitoring

The installation of a telemetry network to relay data from each meter location to a central monitoring computer is a key recommendation. This would enable the MDC to receive continuous information on meter flows and pipeline pressures from all meter locations. By adding telemetered data from the MDC's master meters (those which are used to monitor flows at key points on the main transmission lines), it will be possible to provide an instantaneous and accurate accounting of water entering the MDC distribution system in comparison with water delivered to user communities. By monitoring flows and pipeline pressures, sudden breaks as well as long-term trends in leakage can be identified.

Meter Maintenance

Upgrading the MDC's meter repair capabilities was also recommended. At present, the MDC has a minimal repair force and relies mainly on maintenance contracts with private firms. The study recommends the construction of a new meter repair shop and a larger staff trained to repair the new equipment.

The Water Division is in the process of implementing these recommendations. Design of the metering improvements will begin shortly. Total project cost is estimated at \$3.3 million.

METROPOLITAN DISTRICT COMMISSION

WATER CONSERVATION REPORT

FEDERAL WATER POLICY

June, 1979

The President's water policy was announced on June 6, 1978. The announcement followed a year of study in which the federal executive branch was directed to review present federal water resource policy with water conservation as its cornerstone. The President noted that:

"water conservation has not been addressed at a national level even though we have pressing water supply problems. Of 106 watershed subregions in the country, 21 already have severe water shortages. ...The nation's cities are also beginning to experience water shortage problems which can only be solved at very high cost. In some areas, precious groundwater supplies are also being depleted at a faster rate than they are replenished. In many cases, an effective water conservation program could play a key role in alleviating these problems.

"Managing our vital water resources depends on a balance of supply, demand and wise use. Using water more efficiently is often cheaper and less damaging to the environment than developing additional supplies."

The President directed that water conservation be added to the standards by which federally constructed water projects are evaluated, and required all federal agencies with programs affecting water supply or consumption to encourage water conservation.

Specific directives to the federal agencies included:

- . requiring water conservation as a condition of federal assistance
 - in water supply and wastewater treatment grant and loan programs of the Environmental Protection Agency, Department of Agriculture and Department of Commerce;
 - in the housing assistance programs of the Department of Housing and Urban Development, Veterans Administration and the Department of Agriculture; and,
 - for new contracts for storage and delivery of municipal and industrial water supplies from federal projects (affecting the Department of the Interior's Bureau of Reclamation, Departments of Agriculture and Energy, Army Corps of Engineers, and the Tennessee Valley Authority)
- requiring water conservation standards in federal buildings
- encouraging water conservation in agricultural assistance programs for water-short areas
- providing technical assistance for water conservation in water-short areas through the Departments of Housing and Urban Development, Interior and Agriculture.

The administration is in the process of developing measures to put the President's directives into effect through a series of task forces under the direction of the Department of the Interior.

MASS EAP 2-10291/006

METROPOLITAN DISTRICT COMMISSION

WATER CONSERVATION REPORT

STATE WATER SUPPLY POLICY

June, 1979

"A reasonable and equitable balance between resource use and its protection and conservation" was a major goal of the Massachusetts Executive Office of Environmental Affairs in developing a water policy for the Commonwealth. The Massachusetts Water Supply Policy Statement of May, 1978 found that among the general problems that summarize the basic water related issues in the state, there was an imbalance between population and the available water resources. Intensive urban development in the Commonwealth occurs primarily within those areas of the state that have the least natural water resources.

In addition, a lack of water consciousness was evident. The public was found to be generally ignorant of the sources of their water, the limitations, and the compromises necessary to assure a continued supply.

In response, the Water Supply Statement advised that "policies for supply augmentation must be coupled with equally strong policies and actions for water conservation."

Recommended programs included:

- . statewide conservation information and education programs to develop a high level of water consciousness and maximum water conservation;
- . comprehensive metering and meter maintenance;
- . state support for systems rehabilitation;
- . facilitation of municipal and industrial recycling of water;
- . state review and incentives for conservation-oriented pricing policy; and,
- . installation of water-saving devices.

Programs recommended to implement state water policy included strengthening the MDC's supply capability consistent with state growth policy. The Water Supply Statement directed that such programs must also effect joint supply and conservation arrangements between the MDC and their member communities; should "provide for conservation and systems rehabilitation and continue analysis of options and support measures to augment MDC supplies; should provide guidelines for expanding the MDC service areas (including requiring prior conservation and maintenance of local supplies); and should institute projects to improve and rehabilitate the distribution system of the MDC."

In response to these directives as well as to its own analysis of the water supply/demand imbalance, the MDC has initiated planning and action in three major program areas:

- . it has adopted a policy not to accept new members until additional supply becomes available unless service to the community is required by legislative mandate;

- . it is studying new supply augmentation plans; and,
- . it is developing conservation policy as an important element in an overall water resources management program.

Summaries of the Massachusetts Water Supply Policy Statement are available from the Executive Office of Environmental Affairs, local water superintendents, and many municipal libraries.

In addition, the Water Resources Commission has produced regulations guiding local planning for water resources. Copies of the Water Resource Management Planning Regulations are available from the Secretary of State's Office.

METROPOLITAN DISTRICT COMMISSION

WATER CONSERVATION REPORT

WATER USE - INCREASING DEMANDS ON MDC RESOURCES

June, 1979

With occasional exceptions, the amount of water consumed by MDC users has risen steadily since the post World War II period, peaking at an annual average of over 320 mgd in 1971-72. The factors contributing to this overall increase in consumption include increases in the number of communities supplied, as well as a steady increase in residential, commercial and industrial water use.

Population Growth

The population of the communities presently under agreement to use MDC water has increased from 2,183,163 in 1965 to 2,319,786 in 1975. This growth is largely due to the addition of three towns to the Water District.

In addition to this growth, several communities not presently using MDC water face either expanding population or contamination of local supplies so that they foresee no alternative to seeking additional water from MDC sources. The New England River Basins Commission in their 1975 report on water resources in Southeastern New England calculated that the MDC will need an additional 77 million gallons of water per day by 1990 in order to meet demands. These projections assumed an increase in the rate of consumption per capita of 1.1% per year.

Per Capita Consumption

Consumption in terms of per capita per day for all users in member communities wholly supplied by MDC sources rose from an average of 138 gallons in 1963 to 168 gpcd in 1972. By 1978 users in the fully supplied district were averaging 171 gallons per capita per day; a total increase over the past 15 years of approximately 24%, or an average per year increase of about 1.5%

Domestic Use

Domestic consumption alone in member communities ranges from 45 gallons per capita per day to 89 gpcd, based on information collected from the MDC's most recent survey of their communities. This represents an average of 66 gallons of water used at home daily by each person in the member communities.

Rainfall

Periods of low rainfall and high summer temperatures also increase consumer demands on the system. Seasonally higher demands coincide with periods of lowest run-off. In contrast with ground water systems, the reservoir system is able to sustain periods of abnormally high withdrawals. However, long, dry periods may lower reservoir levels, eventually emptying the reservoir or reducing the contents until the remaining portion is unfit for use.

The 1961-66 drought reduced Quabbin Reservoir to 45% of capacity with a reduction in elevation of 34 feet and a reduction in volume of 227 billion gallons. A recurrence

of that drought situation could drop the level to 31% based on current consumption. In a single year such as the drought year of 1965, the reservoirs could be reduced by as much as 80 billion gallons at current consumption. Several years of above-average precipitation since 1972 have produced over 5 inches of additional runoff at the Quabbin Watershed. Only this has forestalled a water shortage which other major factors would indicate is inevitable.

MA 10.2: W29/10.8

METROPOLITAN DISTRICT COMMISSION

WATER CONSERVATION REPORT

SUPPLY AUGMENTATION

June, 1979

Many aspects of water resource management are being explored by the MDC in an effort to close the gap between safe yield and current consumption and to assure future supply. In addition to watershed management techniques to increase runoff into Quabbin Reservoir, two supply augmentation options are under study:

Northfield Mountain Water Supply Project

The Northfield Mountain Water Supply Project is designed to augment Quabbin Reservoir with an additional average annual yield of 72 mgd by diverting a very small portion of the Connecticut River freshet flows. The major facility to be designed and constructed by the MDC to accomplish the diversion is a tunnel aqueduct from the existing Northfield Mountain pumped storage reservoir, built by Northeast Utilities for hydro-electric power production, to Quabbin Reservoir.

The Northfield Project was authorized by the Massachusetts Legislature under Chapter 669 of the Acts of 1967 and Chapter 766 of the Acts of 1970. Under this legislation, the MDC is allowed to divert water from the Connecticut River through the Northfield Mountain pumped storage facility when the flow in the Connecticut River reaches 17,000 cubic feet per second at the U.S. Geological Survey Gaging Station at Montague City. The amount of water available for MDC use during the diversion period is limited to 375 mgd during any three consecutive years. It is expected that the diversion period would be approximately 70 days and generally correspond to the spring freshet season.

The Northfield Mountain Pumped Storage Facility is in the towns of Northfield and Erving and is owned and operated by the Northeast Utilities Service Company. It stores water in an upper reservoir on Northfield Mountain, houses pump-turbine facilities underground inside the mountain and uses the Turners Falls Reservoir in the Connecticut River as its lower pool. The Northfield Mountain Reservoir consists of a system of dams and dikes which provide 740 million cubic feet of storage. It has a drainage area of approximately 0.5 square miles. The Reservoir was constructed to incorporate the water supply diversion. The dam and dike heights were raised approximately four feet to provide about 50 million cubic feet of additional storage capacity for the MDC.

The proposed facilities to be designed and constructed by the MDC, consist of the tunnel aqueduct from Northfield Mountain to Quabbin Reservoir approximately 9.8 miles long, shafts, and an outlet structure and related work at Quabbin Reservoir. Water withdrawn from the Northfield Mountain Reservoir during the diversion period would be conveyed from the existing inlet structure through a pipe to an intake shaft. The intake shaft would be designed to carry water from the Northfield Mountain Reservoir through the tunnel. In the vicinity of the intake shaft, facilities will be required for disinfection, water quality monitoring, river instream monitoring, and laboratory analyses. The methods of disinfection to be investigated are chlorination and ozonation.

The tunnel aqueduct would be sized to carry the amount allowed during the diversion

period. It would extend to an outlet into the middle branch of Quabbin Reservoir in New Salem.

The MDC is proceeding with the preparation of an environmental study to examine possible impacts of the diversion and alternatives to it. The environmental impact report will take at least two years to complete.

Upper Sudbury River Project

The MDC is evaluating the water supply potential of the MDC's Sudbury River works. The Sudbury Watershed was a major source of supply for the metropolitan Boston area until water quality considerations restricted its use.

In 1975, an engineering feasibility study was prepared for the Upper Sudbury Watershed. This study examined several alternatives for developing all or part of the 75 square miles of MDC watershed on the Sudbury River as a full-time water supply.

An amendment to this 1975 study is currently underway. This new alternative will investigate the full-time water supply use of only the 22 square mile Sudbury Reservoir Watershed, which may provide as much as 20 mgd of water for MDC consumers.

The MDC presently controls the Sudbury Reservoir but uses the water only under emergency conditions because of its comparatively poor quality. Treatment will be necessary to meet water quality standards for color and turbidity. In the alternative being studied, the water would be withdrawn through existing intake works at Sudbury Reservoir Dam, treated at the proposed treatment facility, and discharged to the MDC's Weston Aqueduct to be conveyed to the District.

Issues being investigated in the current amendment study will include the safe yield of Sudbury Reservoir, the degree of treatment necessary, optimum treatment plant sizing, site location, recreational possibilities, preliminary identification of environmental effects, and a cost effectiveness analysis.

If the recommendations of the amendment study indicate that the project is feasible, an environmental impact report on the recommended alternative will be undertaken. The feasibility study will be completed by the summer of 1979 after which the environmental impact report will be prepared. It will be several years before the Sudbury water may be added as a permanent part of the MDC's water resource system.

Both these major projects require significant lead time of at least 5-10 years. Assuming that decisions are made to go forward with Northfield or Sudbury following studies of their environmental impacts, litigation could further delay the projects. Planning decisions about various supply augmentation, conservation or watershed management techniques must recognize the realistic future date when the new supply will actually be available. In the interim, conservation techniques must be employed to assure adequate supplies.

MASS: E145.2 W 291/9

METROPOLITAN DISTRICT COMMISSION

WATER CONSERVATION REPORT

#9

October, 1979

WATERSHED MANAGEMENT PROGRAM

The Metropolitan District Commission Water Division is planning to intensify its forest management program which is designed to maintain and increase water runoff from the lands under its control in the Ware River, Quabbin and Wachusett Reservoir watersheds. The program calls for a trebling of the forestry staff to increase the level of effort in selective cutting and patch clearing for timber and cordwood sales. The conversion of pine and spruce plantations to fields is a new aspect of the program.

This management program emphasizes the reduction of water loss due to plant absorption and evaporation called evapo-transpiration. Often the water lost through trees in this manner is greater than that lost through evaporation from the surface of a reservoir. It has been documented that on unmanaged watersheds, runoff decreases as the forest grows older and consumes more of the available moisture. Consequently, some management practices are necessary just to maintain the present yields of MDC watershed lands.

Forest management on the Quabbin Reservation concentrated on tree planting and some harvesting from the 1930's through 1961. Forestation of open fields was an important part of this early program. Silvicultural principles using selective marking procedures for all timber sales were initiated in 1962 with the development of the first ten-year management program.

The revised program incorporates selective cutting and clearing techniques employed in recent research which demonstrated their potential for increasing water yields. Reduced forest stocking will characterize the new program in addition to an increased level of effort which will enable treatment of almost all manageable lands in the next ten years. Selective cutting and patch clearing will be expanded to include converting old pine and spruce plantations to fields. Eventually forest coverage will be reduced by some 10%.

These forest practices are also designed to incorporate the more traditional goals of health and diversity of the forest and wildlife communities. Although the Quabbin lands are reserved primarily to protect the watershed, it is also a forest preserve, a wildlife sanctuary--providing a home for several rare and endangered species--a research area, and a park. It has sections which may be characterized as wilderness. In a populated state like Massachusetts, the value of such an area cannot be over estimated. Chapter 737 of the Acts of 1972 articulated this value and reiterated the mandate for conserving the "wilderness, watershed and reservoir character" of the Quabbin and Ware River Reservations. Section 2 directs that, "the natural ecology of the district shall be maintained, and it shall be conserved in its present degree of wilderness character and shall be protected in its flora and fauna in all reasonable ways to assure the balanced wildlife habitat..."

The management practices employed are balanced not only for their impact on water yields but also to protect these wilderness and wildlife values. The goal is to obtain a diverse, durable, productive, and aesthetically pleasing environment. Patch clearing, for example, increases the "edge effect" which encourages wildlife. Fields created where pine and spruce plantations are cleared will be planted with desirable wildlife foods such as rye and other special grasses to supplement the forest forage. Large populations of deer and beaver in turn help control the regrowth of both cleared and thinned forest areas and, therefore, the maintenance of increased yields. In the Ware and Wachusett areas where deer herds are smaller, local farmers will be using and maintaining the fields.

Studies indicate that this forestry program, after ten years of operation, will maintain and probably increase the water yields of the acreage owned by the MDC, providing a complementary maintenance program can keep level with the progress. The cost of the expanded program will be offset by timber and cordwood sales. The MDC has requested in its budgets over \$160,000 in new equipment and personnel for this program. These expenditures must be approved by the Legislature.

The management plan is limited to the 81,800 acres of watershed land which the MDC owns. Of the MDC-owned lands, moreover, some 13,800 acres are non-manageable. These are primarily islands, beaver ponds, wetlands, steep or rocky areas, recreational and administrative areas, or places of special aesthetic value. All water edges along streams, rivers, ponds, and the Quabbin Reservoir will be maintained in natural condition and buffered from logging operations within a minimum of 100 feet. The buffer zone will be expanded where there are steep slopes, gorges, waterfalls, wetlands, exceptional stands of timber, or other important natural features.

The following table indicates the approximate manageable acreage at each watershed area:

Total Watershed Area	MDC Owned Land (acres)	Non-manageable Acres	Total Management Acres ¹
Quabbin 94,040*	56,000	10,000	46,000
Ware 62,720	20,000	3,000	17,000
Wachusett 68,921**	5,800	800	5,000
225,681	81,800	13,800	68,000

* Does not include 25,000 acres of Reservoir.

** Does not include 4,200 acres of Reservoir.

¹The use of the Sudbury Reservoir is presently under study. The lands around this reservoir will also be managed when a program for its use is completed.

About 20,000 acres have already been treated under the management program since 1962. Over the next ten years the program calls for annual selective cutting and clearing of 2,600 acres at Quabbin, 1,000 acres in the Ware River Watershed, and 500 acres at Wachusett, with Sudbury to be added when plans are complete. This schedule must be carried out in consecutive years and the cleared acreage maintained in order to produce and hold maximum increased yields.

The actual level of increased water yields to be anticipated for the management acreage is uncertain. A one-year experimental program at Cadwell Creek in the Quabbin Watershed documented potential increases. However, management problems may prevent the maintenance of the maximum potential yield increases for each managed acre over the ten-year period.

It is also not yet determined whether a potential increase in the total safe yield of the system may be anticipated as a result of the watershed management program's contribution. Actual increased yields will have to be measured over time. A realistic assessment of the potential increase in safe yield following the management program is part of the scope of work for the Environmental Impact Study of the proposed Northfield Mountain Water Supply project.

METROPOLITAN DISTRICT COMMISSION

WATER CONSERVATION REPORT

#10

October, 1979

CONSERVING WATER IN BOSTON:

A Renovation Program for the City's Water Supply System

The Boston Water and Sewer Commission (BWSC) provides water and sewer service to nearly 90,000 customers in the city of Boston. It purchases the water from the Metropolitan District Commission and distributes it to its consumers through approximately 1,080 miles of pipes ranging in diameter from 4 to 48 inches.

Almost 50% of all the water which the MDC sells to its user communities is purchased by the BWSC. However, in recent years Boston's total water consumption, and in turn, its total purchased from the MDC, has decreased.

Since 1976 Boston's average daily usage of water has decreased steadily. In 1976 Boston used 150.4 million gallons per day (mgd), which is approximately 10 mgd more than the 1979 estimated usage of 140 mgd.

Several programs developed and being implemented by the BWSC will or have already, impacted significantly the city's water consumption. These programs include a three-year capital improvement program (1979-1981), an extensive city-wide metering program, and a system-wide leak detection survey.

Capital Improvement Program

The BWSC's capital improvement program is aimed at replacing or reconditioning by the year 2000 all water pipes over 100 years old. It is estimated that 20% of Boston's water pipe system was built prior to 1900. This means that approximately 53,500 linear feet of pipe must be either relayed or relined annually. This program has just been implemented so there are no figures presently available. However, it is anticipated that once completed, it should reduce the amount of water the city purchases.

Metering

In 1978 a consulting firm estimated that approximately 20-30% of the water the BWSC purchased was not recorded on consumer meters. Although these estimates could not be verified, the BWSC has launched an extensive metering program which includes replacement of broken, under-registering, or leaking residential meters and installation of outside reading devices. A cyclical meter replacement program for residential customers will be put into effect by 1981 to insure that all residential meters are working at peak accuracy. This program should increase significantly the amount of accounted-for water in the residential sector.

In addition, the BWSC has undertaken a program to annually test the accuracy of the meters used by our 200 biggest industrial consumers.

Finally, the BWSC is completing a public facilities metering program. Prior to the creation of the BWSC, the city was never charged for water it consumed. Now legal requirements necessitate that all public facilities be metered in order to accurately account for and bill their water usage. This requires the metering of public facilities and the maintenance of accurate meters at some 700 city-owned properties. In 1978 the city properties were billed at an estimated consumption of 4.36 mgd.

With accurate metering, it is estimated that the amount of accounted-for water will increase, which should encourage conservation programs in public buildings, residences, businesses, and industries.

Leakage Detection and Repair

A comprehensive leak detection program has been implemented to locate and repair leaks which represent a significant portion of the system's unaccounted-for water.

A specialized consulting firm using accoustical listening devices and other highly sensitive instruments has been hired to survey the distribution system. During the first 9 months of 1979, 112 leaks were located which were wasting approximately 2.9 million gallons of water each day. This is a substantial increase over the 1976-1977 leakage survey which located 39 leaks wasting 0.97 mgd.

Boston Water and Sewer Commission
10 Post Office Square
Boston, Massachusetts 02109
(617) 426-6046

METROPOLITAN DISTRICT COMMISSION

WATER CONSERVATION REPORT

#11

December, 1979

WATER CONSERVATION PROGRAMS IN MASSACHUSETTS COMMUNITIES

In recent years, many water suppliers have incorporated conservation programs into the management of their systems and are ready to share their experiences with others. Through a survey of 218 urban water suppliers serving more than 10,000 New Englanders each, the New England River Basins Commission (NERBC) has compiled a list of measures used by these suppliers. NERBC conducted the survey as part of its Urban Water Conservation Project in cooperation with the New England Water Works Association, with funding from the Resources and Land Investigations (RALI) program, U.S. Geological Survey.

All data contained in the list have been substantiated in telephone conversations with the various suppliers, and each respondent was notified by the NERBC of MDC's intention to publish the information for use by its member communities. The intent in providing this information is that MDC communities will benefit by the experiences of others as they begin designing their own conservation programs.

Information on the size of the population served is given for each community as well as the water usage by category so that other suppliers may compare measures used in communities similar to their own. The user categories listed indicate what percentage of the consumers supplied is residential, and what percentage is commercial and/or industrial.

1. Use Restrictions. These include public orders which are either mandatory (legally enforceable) or "voluntary". They may ban one or more specific type of use (such as lawn watering), limit the time for a particular use, or even restrict the amount of water allowed.
2. Public Education. These programs vary widely. They are usually targeted to domestic users and are most often employed in conjunction with another conservation program.
3. Plumbing Code Revisions. These refer to changes in plumbing code regulations to restrict the installation of fixtures to those models which are designed for low water use.
4. Water Saving Devices. A conservation program under this heading would be one which promotes the use of devices designed to reduce water consumption by changing the design of the conventional plumbing system. Devices range from simple plastic disc inserts, which restrict water flow in faucets and showers, to devices which require no water at all, such as the compost toilet.
5. Pricing Techniques. These refer to any rate structure designed not only to recover the total cost of service but also to encourage conservation because user charges are based on the cost of the water actually consumed. Rate revisions may be oriented toward modifying peak demands or modifying average demands.
6. Leak Detection and Repair. A program under this category usually refers to the location and repair of leakage in the distribution pipes in an effort by the water utility to reduce system losses. A program by large industrial/commercial users to survey their plants for leakage repair or house-to-house surveys may also fall within this category.
7. Building Moratorium. A moratorium on building in the community may also include a moratorium on sewerage connections. The aim is a general halt on new construction.

In using the reference list, it should be noted that:

- . Although programs initiated by the various water systems have been grouped together in seven general categories, there is great variability in the form, intensity, and duration of the measure employed.
- . In many cases the reported measures have not been employed for the purpose of reducing water consumption per se, but have had an observable impact on total or per capita water demand.
- . Conservation programs have been promoted by private groups in some communities but these are not included in this survey.
- . Because all 218 urban water suppliers did not respond to the survey, the list may exclude some communities currently employing water conservation measures.
- . No attempt has been made to judge the effectiveness of the programs employed.
- . Some of the measures listed are under study prior to implementation by the community.

Questions about the survey should be directed to the Urban Water Conservation Project at the New England River Basins Commission (617-223-6244).

EXISTING WATER CONSERVATION MEASURES IN MASSACHUSETTS COMMUNITIES

Prepared by the New England River Basins Commission, Urban Water Conservation Project, 53 State Street, Boston, 02109
(Tel. 617-223-6244) in cooperation with the New England Water Works Association.

Name of Public Water System	Population Served	User Category By Percent R/C, I*	Existing Conservation Measures**	Source of Additional Information
Water Supply District of Acton	15,500	70/16	1, 6	P.O.Box 953, Acton, MA 01720 (617) 236-9108
Adams Fire District	13,140	55/43	1	3 Columbia St., Adams, MA 01220 (413) 743-0179
Amherst Water Div.	26,331	48/4	1,2,4,5	586 South Pleasant St., Amherst, MA 01002 (413) 253-3355
Arlington Water Dept.	52,480	70/0	2,6	730 Massachusetts Ave., Arlington, MA 02174 (617) 643-6700
Bedford Water Dept.	12,000	50/43	5	16 South St., Bedford, MA 01730 (617) 275-7605
Bellingham Water Dept.	14,300	82/6	6	200 Wrentham Rd., Bellingham, MA 02019 (617) 883-7803
Belmont Water Dept.	27,750	82/6	6	35 Woodland Road, Belmont, MA 02178 (617) 484-2300
Billerica Water Dept.	36,000	50/35	1	250 Boston Road, North Billerica, MA 01862 (617) 667-3866
Boston Water & Sewer Commission	637,986		6	10 Post Office Square, Boston, MA 02109 (617) 426-6046
Bridgewater Water Dept.	17,700	50/20	4, 6	Academy Bldg., Central Sq., Bridgewater, MA 02324 (617) 697-4665
Brockton Water Dept.	89,040	75/4	1, 2	City Hall Square, Brockton, MA 02401 (617) 580-1100
Brookline Water Dept.	58,886	75/5	6	Dept. Public Works, 333 Washington St. Brookline, MA 02146 (617) 232-9000
Burlington Water Dist.	24,268	25/55	2, 6	Center St., Burlington, MA 01803 (617) 272-6700
Chelmsford Water Dist.	15,130	80/15	1	Town Hall, One North Rd., Chelmsford, MA 01824 (617) 256-2931
Dartmouth Water and Sewer Commission	22,340	85/10	2, 6	751 Allen St., N. Dartmouth, MA 02747 (617) 993-6118
Dedham Water Co.	42,238	50/26	1, 6	20 Milton St., Dedham, MA 02026 (617) 326-8120
Easton Water Dept.	13,000	80/15	1	Elm Street, N. Easton, MA 02356 (617) 238-2621
Everett Water Dept.	40,000	25/65	6	48 East Elm St., Everett, MA 02149 (617) 387-3841
Franklin Water Dept.	18,500	50/30	1	West Central St., Franklin, MA 02038 (617) 528-1570
Gloucester Water Dept.	28,000	30/60	1, 2	Box 700, Gloucester, MA 01930 (617) 283-5940
Greenfield Water Dept.	19,300	71/11	6	14 Court Square, Greenfield, MA 01301 (413) 772-0166
Hanover Water Dept.	11,009	40/24	1,2,5,6,7	40 Pond St., Hanover, MA 02339 (617) 826-3189
Hingham Water Co.	29,562	60/15	2, 6	28 South St., Hingham, MA 02043 (617) 749-0801
Holbrook Water Dept.	11,796	96/4	1	Town Hall, Holbrook, MA 02343 (617) 767-4312

Holbrook Water Dept.	11,796	96/4	1	Town Hall, Holbrook, MA 02343 (617) 767-4312
Holden Water Dept.	13,000	2,3,4	2,3,4	87 Adams Rd., Holden, MA 01520 (617) 829-4943
Holyoke Water Works	49,434	6	6	20 Commercial St., Holyoke, MA 01040 (413) 536-0442
Hudson Water Division	17,500	90/10	1	One Municipal Dr., Hudson, MA 01749 (617) 562-9333
Ipswich Water Division	11,550	60/15	1,5,6	DPW, 3 Elm St., Ipswich, MA 01938 (617) 356-5592
Lawrence Water Works	66,915	50/10	2	City Hall, Common St., Lawrence, MA 01841 (617) 685-5754
Lexington Water Dept.	32,480	73/13	6	201 Bedford St., Lexington, MA 02173 (617) 862-0500
Longmeadow Water Dept.	17,500	42/23	1	30 Williams St., Longmeadow, MA 01106 (413) 567-1281
Malden Water Dept.	55,463	65/15	6	DPW, City Hall, Main St., Malden, MA 01945 (617) 322-2635
Marblehead Water Dept.	20,942	60/30	1	78 Commercial St., Marblehead, MA 01945 (617) 631-0102
Marshfield Water Dept.	21,292	90/10	2,3,4	870 Moraine St., Marshfield, MA 02050 (617) 837-5141
Medford Water Dept.	62,162	53/22	6	52 Swan St., Medford, MA 02155 (617) 396-5500
Melrose Water Dept.	34,000	38/21	5,6	City Hall, 562 Main St., Melrose, MA 02176 (617) 665-0065
Methuen Water Dept.	35,081	55/16	6	90 Hampshire St., Methuen, MA 01844 (617) 685-6100
Milford Water Co.	25,000	60/20	6	226 Main St., Milford, MA 01757 (617) 473-5110
Natick Water Dept.	31,055	80/10	1	44 Middlesex Ave., Natick, MA 01760 (617) 653-2710
Needham Water Dept.	30,000	93/4	6	DPW, Needham, MA 02192 (617) 444-5100
New Bedford Water Dept.	101,082	56/21	6	City Hall, New Bedford, MA 02740 (617) 999-2931
Newburyport Water Dept.	17,000	80/17	6	City Hall, Pleasant St., Newburyport, MA 01950 (617) 462-2991
North Attleboro Water Dept.	18,500	42/31	1	240 Smith St., N. Attleboro, MA 02760 (617) 699-7545
North Andover Water Dept.	16,185	56/21	6	384 Osgood St., N. Andover, MA 01845 (617) 687-7964
Northboro Water Dept.	10,500	12,539	2,3	Town Hall, 63 Main St., Northboro, MA 01532 (617) 393-6761
North Reading Water Dept.	12,000		1	DPW, Town Hall, N. Reading, MA 01864 (617) 664-3178
Norton Water Dept.	11,000		1,2,4,7	P.O. Box 437, Norton, MA 02766 (617) 285-6301
Norwood Water Dept.	33,000		6	P.O. Box 40, One Lyman Pl., Norwood, MA 02062 (617) 762-1413
Peabody Water Dept.	50,000		6	75 Central St., Peabody, MA 01960 (617) 531-5135
Pembroke Water Dept.	12,539		1	Town Hall, Pembroke, MA 02359 (617) 293-3874

* R = Residential; C, I = Commercial, Industrial

* 1 = Use Restrictions
2 = Public Education
3 = Plumbing Code Revisions
4 = Water Saving Devices
5 = Pricing Techniques
6 = Leak Detection/Repair
7 = Building Moratorium

Name of Public Water System	Population Served	User Category By Percent R/C, I*	Existing Conservation Measures**	Source of Additional Information
Quincy Water Dept.	91,200	52/15	2, 6	55 Sea St., Quincy, MA 02169 (617) 773-1380
Randolph-Holbrook Water Dept.	41,796	96/4	1	Randolph Town Hall, Randolph, MA 02368 (617) 963-4333
Scituate Water Division	18,000	90/5	6	2 Old Oaken Bucket Rd., Scituate, MA 02040 (617) 545-0033
Sharon Water Dept.	13,378	95/3	2, 6	90 South Main St., Sharon, MA 02067 (617) 784-5961
Somerset Water Dept.	18,729	57/40	2, 6	Box 35, Somerset, MA 02726 (617) 674-4215
Southbridge Water Supply Co.	17,600	45/40	6	70 Foster St., Southbridge, MA 01550 (617) 764-3207
Stoneham Water Dept.	22,000	41/36	1	16 Pine St., Stoneham, MA 02180 (617) 438-2583
Stoughton Water Dept.	26,500		1, 5, 6	950 Central St., Stoughton, MA 02072 (617) 344-6656
Sturbridge Water Dept.	12,500	66/34	2, 6	P.O. Box 187, Sturbridge, MA 01518 (617) 347-3869
Swampscott Water Dept.	14,329	90/5	6	Public Works, 22 Monument Ave., Swampscott, MA 01907 (617) 581-7500
Wakefield Water Dept.	26,040	47/38	6	Town Hall, One Lafayette St., Wakefield, MA 01880 (617) 245-2802
Waltham Water Dept.	56,757	40/40	1	25 Lexington St., Waltham, MA 02154 (617) 893-5711
Wayland Water Dept.	13,265	60/25	2	410 Cochituate Rd., Wayland, MA 01778 (617) 358-7701
Wellesley Water Division	26,593	75/0	5, 6	455 Worcester St., Wellesley Hills, MA 02181 (617) 235-7600
Weston Water Dept.	11,000	85/0	6	71 Warren Ave., Weston, MA 02193 (617) 893-7320
West Springfield Water Dept.	28,249	50/37	1	26 Central St., W. Springfield, MA 01089 (413) 781-7550
Whitman Water Division	13,850	70/20	1, 6	Town Hall, Whitman, MA 02382 (617) 447-5547
Wilmington Water Dept.	17,251	45/54	1	Town Hall, Middlesex Ave., Wilmington, MA 01887 (617) 658-4711
Winchester Water Dept.	22,723	80/6	6	15 Lake St., Winchester, MA (617) 729-3503
Worcester Water Dept.	172,342		4, 5	DPW, 18 East Worcester St., Worcester, MA 01604 (617) 798-8151
Yarmouth Water Dept.	17,000	75/10	5	102 Union St., Yarmouthport, MA 02675 (617) 362-3531
Westfield Water Dept.	34,000	70/30	1	59 Court St., Westfield, MA 01085 (413) 568-1612

